The section is devoted to the alteration by change of natural conditions or by death; the contraction by chemical reaction; the contraction by absorption of water; the disintegration by bacteria and minute infusorians. Formulæ are cited, having special value for:

A. Organisms with delicate walls and rather thin and watery endoplasm;

B. Organisms with endoplasm of ordinary density; and

C. Organisms with apparently dense endoplasm.

VII. The value of the materials commonly used for cell-construction is discussed in this section, particularly shellac, gold-size, Bell's cement, copal, and zinc. The various objections to all the above materials are stated, and then the attention is directed to the employment of balsam-paraffin for cells, the method of employment being carefully described in detail.

Balsam paraffin consists of the hardest paraffin that can be obtained, to which is added about 5 per cent. of Canada balsam. When used it is just melted on the warming-table, and cells of any depth spun with a brush on the turn-table in the usual way. They are ready for immediate use, do not dim the cover-glass like wax cells, and may be used for any preservatives not solvents of paraffin, such as oils. Before the object and preserving liquid are put in the cell a film of liquid marine glue is run on top of the ring, then the object inserted, the cover pressed down, the excess of fluid absorbed by blotting paper, and a seal of paraffin run on; then any desired finish. The slide is thus completed at once.

J. M. L.

NOTICES OF SOME RECENT WORKS.

Minot, Charles Sedgwick. Human Embryology. 463 Illustrations, pp. 815. N. Y, Wm. Wood & Co., 1892.

Although this work may not be exactly recent, it is noted here because it is undoubtedly the most complete and thorough work that has yet appeared in that branch of microscopical science called embryology. It begins with the uterus, and adopts the historical method of treatment so far as is necessary to an understanding of the changes that have taken place in the views of scientific observers on the subjects treated of. Frequent references are made to the

development of vertebrates other than man, and a large proportion of the figures, especially of human embryos and parts thereof, are original.

A Bibliography of Vertebrate Embryology, by Charles Sedgwick Minot, containing three thousand titles classified by subjects and indexed by authors. 4to, Boston, 1892. Published and for sale by the Boston Society of Natural History.

In ordinary books this would be included in the first work, and it is evidence of the extent and thoroughness of the former that it is found desirable to publish the bibliography in a separate volume.

Sternberg, M. D., George M, Surgeon General U. S. Army. **A Manual of Bacteriology. New York, Wm. Wood & Co., pp. 886, 1893.**

In the history of scientific literature there are some books published from time to time that are epoch-making in the sense that they are not mere copies of previous books with the matter arranged in a little different form, but contain the results of original research of their authors and of all other men who have worked on the subject since the last similar work. Such a book is a synopsis of all that is known on the subject at the time of its publication, and if the author is competent to select his matter with good and impartial judgment he book is the indispensable authority on its subject. But few such books have been published in America, and this work and the previous one here cited are among the best examples of this class. We have first described the modes of investigation, methods of culture, staining and photographing, the apparatus employed, also classification, then, in part second, general biological characters, while parts third and fourth discuss in the fullest manner both pathogenic bacteria and saprophytes, the whole illustrated with 268 figures. In a branch of science which has developed so rapidly and so largely as bacteriology it cannot be said of any book that it represents full knowledge of the subject much longer than for the day it is completed; but this is an insurmountable difficulty, and in any case such a work brings us to a convenient starting point for farther investigation. It must remain for some time the chief book of reference on this subject.

Bennett and Murray. A Hand book of Cryptogamic Botany. Longmans, Green & Co., 15 E. 16th St., New York, 1889, pp. 473.

Most of the text books on structural botany published within the last few years contain more or less matter on the cryptogams, but they are rarely so full or exact on this branch of microscopy as is desirable for any one who wishes a good knowledge of the subject. Except this, no work devoted to it has been published since that of Berkeley in 1857, and numerous advances have been made, which are as well set forth in the present book as space will allow. This work is copiously illustrated and gives due space to the fossil forms, to the important bearing of fungi on fermentation, and to the curious relations existing between fungi and algæ in lichens.

Dodge, Charles Wright, M. S. Elementary Practical Biology, a Laboratory Guide for High School and College Students. New York, Harper & Brothers, 1894.

This work is an attempt to put the steps of laboratory work in biology, both plants and animals, in a series of questions, adapted to each particular form examined. It is intended to be used in that kind of teaching which expects the student to find out everything by his own observation, and hence it does not, except incidentally, contain any descriptions of anything. The appendix contains a list of the compounds used as reagents and a bibliography of the books on the subjects treated, where the information required to answer the questions may be found. Such a book is quite as much for the teacher as for the student, and the latter is just as apt to come to rely on the text for the steps of his work as in the old didactic method of teaching. The student will make the greatest progress by a judicious mixture of the two forms of instruction. In this work there is an effort made to use as the most prominent name for some of the plants referred to an alleged common name, such as stone wort for Chara. We think this a mistake, because there is no necessity for common names at all, as the constant use of botanical names, such as Petunia, Dahlia, Fuchsia, etc., by everybody demonstrates every day. We doubt if laymen ever use stone wort or any other name for Chara than the very general one of water weed, and there is nothing but a mistaken sense of affectation, wholly foreign to the scientific spirit, which forbids the use of scientific names in common conversation. The practice of Dr. Gray of placing in his botany a common name for every species, almost the whole of which

names he coined and which never had any authority drawn from actual use, appeared to us always as unfortunate, although it sprung from the kindest intentions.

Waite, Merton B. The Pollination of Pear Flowers. Bulletin No. 5, Department of Agriculture, Division of Vegetable Pathology. 86 pp. Illustrated. 1894.

From the standpoint of practical fruit culture, few discoveries have been made in recent times more important than that which is described in the above pamphlet. While engaged in investigating diseases caused by fungi, Mr. Waite's attention was directed to the sterility of pear trees under conditions that seemed unreasonable, and on studying the case he became convinced that it was due to a heretofore unsuspected character of the pear tree, viz., sterility of the flowers to their own pollen. Careful observation and experiments in artificial fertilization extending to thousands of trees confirmed this view, which must now be regarded as well established.

The conclusions arrived at are as follows:

(1.) Many of the common varieties of pears require cross-pollination, being partially or wholly incapable of setting fruit when limited to their own pollen.

(2.) Some varieties are capable of self-fertilization.

(3.) Cross-pollination is not accomplished by applying pollen from another tree of the same grafted variety, but is secured by using pollen from a tree of a distinct horticultural variety, *i. e.*, which has grown from a distinct seed. Pollen from another tree of the same variety is no better than from the same tree. This failure to fruit is due to the sterility of the pollen and not to mechanical causes.

(4.) The impotency of the pollen is not due to any deficiency of its own, but to the lack of affinity between the pollen and the ovules of the same variety.

(5.) The pollen of two varieties may be absolutely self-sterile and at the same time perfectly cross-fertile.

(6.) The state of nutrition of the tree and its general environment affects its ability to set fruit either with its own pollen or that of another tree.

(7.) Bees and other insects are the agents for the transportation of pollen.

(8.) Bad weather during flowering time has a decidedly injurious influence on fruitage by keeping away insect visitors and also by

affecting the fecundation of the flowers; conversely, fine weather favors cross-pollination and the setting of fruit.

(9.) Pears produced by self-fertilization are very uniform in shape. They differ from crosses not only in size and shape, but also in some cases in time of maturity and in flavor.

(10.) Among the crosses the differences were slight or variable, so that their variations are not to be ascribed with certainty to differences in pollen.

(11.) Self-fecundated pears are deficient in seeds, usually having only abortive seeds, while the crosses are well supplied with sound seeds.

(12.) Even with those varieties which are capable of self-fecundation the pollen of another variety is prepotent, and unless the entrance of foreign pollen be prevented the greater number of fruits will be affected by it, as shown by the study of Buffum pears.

(13.) The normal typical fruits and in most cases the largest and finest specimens either of the self-sterile or self-fertile sorts are crosses.

PRACTICAL CONCLUSIONS.

(1.) Plant mixed orchards, or at least avoid planting solid blocks of one variety. It is not desirable to have more than three or four rows of one variety together, unless experience has shown it to be perfectly self-fertile.

(2.) Where large blocks of trees of one variety which blossomed well have failed to fruit for a series of years without any apparent reason, it is exceedingly probable that the failure is due to lack of cross-pollination. The remedy is to graft in other varieties and supply foreign pollen.

(3.) Be sure that there are sufficient bees in the neighborhood or within two or three miles to properly visit the blossoms. When feasible endeavor to favor insect visits to the blossoms by selecting sheltered situations or by planting wind-breaks.

Matthew, Charles George, and Francis Edward Lott. The Microscope in the Brewery and Malt-house. London, Bemrose and Sons, 1889, pp. 198. Illustrated.

The authors have brought together in this book most of the information relating to the biologic processes involved in making fermented liquors from a fairly scientific standpoint. The work is a good illustration of the importance the microscope is assuming in

the business affairs of life, and would be a useful aid to any teacher who, as is often the case, introduces his students to microscopic work by making them acquainted with the yeasts.

Butschli, O. Investigations on Microscopic Foams and on Protoplasm. Translated by E. A. Minchin. London, Adam and Charles Black, 1894, pp. 379. Illustrated. Experiments and observations directed toward a solution of the question of the physical conditions of the phenomena of life. A contribution toward a more accurate physical explanation of certain peculiarities of living matter or protoplasm.

The author considers that the structure of protoplasm corresponds to that of the minutest microscopic foams, with the difference that the alveoli of ordinary foams contains air, while protoplasmic foams contain a watery fluid. If such microscopic foams were successfully manufactured, ought they not to show certain peculiarities of protoplasm, and the study of them furnish an essential contribution toward confirming or correcting this view. Part first is devoted to oil foams, then follow investigations on protoplasmic structure, while part two gives a theory and a summary of divergent views. A list of works referred to in the text is added.

J. B. Ellis and B. M. Everhart. North American Pyrenomycetes. Illustrated by F. W. Anderson. Thick octavo, 800 pages, 41 page plates, tinted. Price, $8; 35 cents added if by mail. J. B. Ellis, Newfield, N. J. Contains all known North American Sphœria; the Perisporiaceæ by Prof. T. J. Burrill, with a species index by W. C. Stevenson, jr. The system of classification is that of Winter in Kryptogamen Flora, with acknowledgments of Saccardo's principles of arrangement.

U. S. Department of Agriculture, Division of Entomology. The plant louse and remedies. Circular No. 2, second series, June, 1891.

The Horn Fly, *Hœrnatobia serrata*. Special bulletin, 1889.

Herbert Osborn. The Pediculi and Mallophaga affecting man and the lower animals. Illustrated. Bulletin No. 7.

"Lice" are among the objects which excite curiosity among those who use a microscope. This little pamphlet will enable species to be identified without much difficulty.

Sherborn, Charles Davis. An index to the genera and species of the Foraminifera. Part 1, A to Non, 1893. Smithsonian miscellaneous collections, 1893. An index and synonymy, with full bibliographical references. No descriptions or figures.